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(71) Applicant (for all designated States except US): **THE PILLSBURY COMPANY** [US/US]; 1 General Mills Boulevard, P.O. Box 1113, Minneapolis, MN 55427 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **HUANG, Victor, Tsangmin** [US/US]; 7309 Parkview Drive, Moundsview, MN 55112 (US). **PANDA, Fern, Alane** [US/US]; 1698-17th Avenue N.W., New Brighton, MN 55112 (US). **CHIDA, Kamel** [US/FR]; 1, Grande Rue du Rivage, F-62000 Arras (FR).

(74) Agent: **DAIGNAULT, Ronald, A.**; Merchant & Gould P.C., P.O. Box 2903, Minneapolis, MN 55402-0903 (US).

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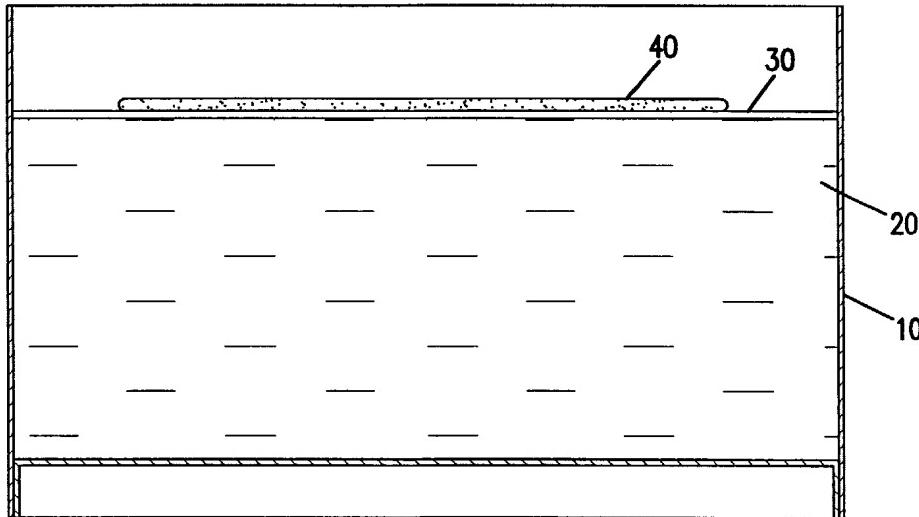
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(54) Title: SWEET, CRUNCHY, AND BRITTLE TOPPINGS FOR FROZEN DESSERTS



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(57) Abstract: A frozen dessert product comprising a frozen dessert, a moisture barrier covering at least one surface of the frozen dessert, and a glassy matrix topping positioned over the moisture barrier is described. The frozen dessert includes ice cream, ice milk, gelato, milk shakes, frozen yogurt, pudding, sherbert, and sorbet. A method for preparing the frozen dessert products of the invention is described. A moisture barrier and a glassy matrix topping for frozen dessert products are also described.



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SWEET, CRUNCHY, AND BRITTLE TOPPINGS
FOR FROZEN DESSERTS

This application is being filed as a PCT International Patent application in
5 the name of The Pillsbury Company, a U.S. national corporation, (applicant for all
countries except the US, and Victor Tsangmin Huang, Fern Alane Panda, and Kamel
Chida, all U.S. citizens, (applicants for the US), on 13 February 2002.

Field of the Invention

10 The invention relates to a frozen dessert product having a sweet, thin,
crunchy, and brittle topping as well as to a method of making the frozen dessert
product. The invention also relates to a moisture barrier and a sweet topping for
frozen dessert products.

15 **Background of the Invention**

Crème brûlée is a popular dessert served in many fine restaurants throughout
the world. Traditional crème brûlée is a rich dessert that is prepared by forming a
crispy, caramelized topping over velvety custard. The caramelized topping is the
distinguishing feature of crème brûlée. The caramelized topping is brittle, crunchy,
20 and sweet. Such a topping could be used on other types of desserts such as any
frozen dessert.

Such a caramelized topping placed over a frozen dessert product could
provide dual texture to a frozen dessert during consumption. Consumers could
break the brittle layer and mix the broken pieces with the frozen dessert prior to
25 consumption. However, such a product prepared by placing a caramelized topping
on a frozen dessert would have a relatively short shelf life and would need to be
consumed shortly after preparation. Moisture from the frozen dessert would
dissolve the caramelized topping. Because of the short shelf life, national
distribution of such a product would be difficult.

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Summary of the Invention

The invention provides a frozen dessert product having a moisture barrier
and a sweet, thin, crunchy, and brittle topping. In particular, the invention provides
a frozen dessert product having a sweet, glassy matrix topping that is separated from
35 the frozen dessert by a moisture barrier. The glassy matrix topping remains crunchy
and brittle upon storage of the frozen dessert product in a freezer for extended
periods of time. Another aspect of invention provides a method for making the

frozen dessert product. The invention also provides a moisture barrier composition and a sweet, glassy matrix topping for frozen dessert products.

One aspect of the invention provides a composition for a frozen dessert product comprising a frozen dessert, a moisture barrier covering at least one surface of the frozen dessert, and a sweet, glassy matrix topping placed over the moisture barrier and separated from the frozen dessert by the moisture barrier. The frozen dessert can include, for example, frozen custard, ice cream, ice milk, gelato, milk shakes, frozen yogurt, pudding, sherbet, and sorbet.

The moisture barrier covers at least one surface of the frozen dessert and is positioned between the frozen dessert and the glassy matrix topping to separate the frozen dessert from the glassy matrix topping. The moisture barrier comprises at least 70 weight percent fat based on the weight of the moisture barrier. At least 60 weight percent of the fat in the moisture barrier is liquid at 40 °F (4 °C).

The sweet, glassy matrix topping is about 1 to about 3 mm thick and comprises a glassy matrix. The glassy matrix contains a glassy phase comprising sucrose, a polysaccharide having a an average degree of polymerization of about 2 to about 4, or mixture thereof. In some embodiments, the glassy matrix contains crystalline sucrose embedded in the glassy phase. The sweet, glassy matrix topping can further comprise a glassy matrix coating covering at least one surface of the glassy matrix.

The invention also provides a method of preparing a frozen dessert product having a thin, sweet, crunchy, and brittle topping. The method comprises (a) covering at least one surface of a frozen dessert with a moisture barrier; and (b) placing a thin, sweet, glassy matrix topping over the moisture barrier. In one embodiment, the frozen dessert is placed in a container such that the frozen dessert conforms to the shape of the container and only the top surface of the frozen dessert is not in contact with the bottom or sidewalls of the container. The exposed top surface of the frozen dessert is covered with a moisture barrier. The sweet, glassy matrix topping is then placed over the moisture barrier.

Another aspect of the invention provides a moisture barrier for frozen desserts. The moisture barrier comprises at least 70 weight percent fat based on the weight of the moisture barrier. At least 60 weight percent of the fat is liquid at 40 °F (4 °C).

Another aspect of the invention provides a sweet, glassy matrix topping for frozen desserts. The sweet, glassy matrix topping is about 1 to about 3 mm thick and comprises a glassy matrix. In one embodiment, the glassy matrix contains about 40 to about 80 weight percent glassy phase and about 20 to about 60 weight percent crystalline sucrose embedded into the glassy phase. In another embodiment, the

glassy matrix topping comprises a glassy matrix and a glassy matrix coating covering at least one surface of the glassy matrix. The glassy matrix coating can be either transparent or opaque.

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Brief Description of the Drawings

Figure 1a is a schematic showing a cross-sectional view of a frozen dessert product in a container. The frozen dessert product comprises a frozen dessert, a moisture barrier, and a glassy matrix topping. **Figure 1b** is a schematic showing the corresponding top view of the frozen dessert product.

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Figure 2 is a cross-sectional view of a glassy matrix topping having a glassy matrix covered with a glassy matrix coating.

Detailed Description of the Invention

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The invention relates to a frozen dessert product having a moisture barrier and a sweet, thin, crunchy, and brittle topping. In particular, the invention relates to a frozen dessert product having a sweet, glassy matrix topping that is separated from the frozen dessert by a moisture barrier. The topping remains crunchy and brittle upon long-term storage in a freezer. As used herein, the term "long-term storage" refers to storage for at least five months. The frozen dessert product can be distributed on a national or international scale because of the good storage stability. Another aspect of the invention provides a method for making the frozen dessert product. Yet another aspect of the invention provides a moisture barrier composition for frozen dessert products that does not crack upon long-term storage in a freezer when the moisture barrier is applied as a coating to a frozen dessert. The invention also provides a thin, sweet, glassy matrix topping composition for frozen dessert products.

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One aspect of the invention provides a frozen dessert product comprising a frozen dessert, a moisture barrier covering at least one surface of the frozen dessert, and a thin, sweet, glassy matrix topping placed over the moisture barrier. In one embodiment of the invention as shown schematically in **Figure 1a**, the composition is in a disposable container 10 such as a paper or plastic cup having a bottom and sidewalls. The frozen dessert 20 is placed inside the disposable container 10 and conforms to the shape of the container. Only the top surface of the frozen dessert is not in contact with the bottom or sidewalls of the container. A moisture barrier 30 is placed on the top surface of the frozen dessert and extends to the inner surfaces of the container sidewalls. A thin layer of the glassy matrix topping 40 is placed over the moisture barrier. **Figure 1a** shows a cross-sectional side view of the

composition in a container and **Figure 1b** shows the corresponding top view. The dimensions of the various components are not drawn to scale.

In other embodiments, the frozen dessert product is not placed in a container. The moisture barrier typically covers more than one surface. In some embodiments, 5 the frozen dessert is encapsulated in the moisture barrier. For example, cubes, rectangles, cylinders, or disks of the frozen dessert are covered with a moisture barrier. The glassy matrix topping is placed on at least one surface of the cube, rectangle, cylinder, or disk. The glassy matrix topping can be placed on more than one surface of the frozen dessert. In one embodiment, a glassy matrix topping is 10 placed both under and over the encapsulated frozen dessert.

The frozen dessert can be in the shape of a cake. The moisture barrier can be placed on the top and side surfaces of the cake. The glassy matrix topping is placed on the top surface of the cake over the moisture barrier.

15 The frozen dessert can also be placed in a cone. The frozen dessert can be placed entirely within the cone or can extend beyond the cone. The top surface of the frozen dessert is typically flat. The moisture barrier covers at least the top surface of the frozen dessert and the glassy matrix topping is placed over the moisture barrier.

20 The frozen dessert can include, for example, frozen custard, ice cream, ice milk, gelato, milk shakes, frozen yogurt, pudding, sherbet, and sorbet. If the frozen dessert is placed in a disposable container, a temperature is chosen for placement such that the frozen dessert flows in the container and conforms to the shape of the container. The temperature can be lowered after the frozen dessert has been placed in the container.

25 The moisture barrier covers at least one surface of the frozen dessert and is positioned between the frozen dessert and the sweet, glassy matrix topping. Preferably, the moisture barrier covers all surfaces of the frozen dessert that are not in contact with a container in which the frozen dessert is placed. In one embodiment of the invention, the moisture barrier covers only a top surface of the frozen dessert 30 and all other surfaces of the frozen dessert are in contact with the bottom or sidewalls of the container.

35 The moisture barrier is typically applied as a thin layer having a thickness of about 1 mm to about 3 mm. If the moisture barrier is too thin, coverage of the frozen dessert by the moisture barrier can be incomplete. This can cause the sweet, glassy matrix topping to lose crispiness or dissolve under long-term storage conditions. If the layer is too thick, the presence of the moisture barrier is more apparent to a consumer. Additionally, when the frozen dessert is within a container, a thicker moisture barrier has an increased tendency to pull away from the sidewalls

of the container leaving a portion of the frozen dessert incompletely covered with the moisture barrier. In some embodiments, the moisture barrier has the appearance and consistency of the frozen dessert when hardened.

To remain an effective moisture barrier during long-term storage at -10 °F (-5 °C), the typical temperature used to store frozen dessert products, the moisture barrier preferably remains free of cracks over time. To minimize cracking, a high percentage of fat that is liquid at 40 °F (4 °C) is included in the moisture barrier. The moisture barrier contains at least 70 weight percent fat and at least 60 weight percent of the fat in the moisture barrier is liquid at 40 °F (4 °C). The moisture content of the moisture barrier is typically less than about 1 weight percent based on the weight of the moisture barrier.

Suitable fats that remain liquid at 40 °F (4 °C) include, for example, various food oils, medium chain length triglycerides, and mixtures thereof. As used herein, a "medium chain length triglyceride" refers to a medium chain length triglyceride having a chain length of six to ten carbon atoms. Suitable food oils include soybean oil, cottonseed oil, peanut oil, sunflower oil, safflower oil, corn oil, canola oil, and the like.

Other fats such as, for example, coconut oil, cocoa butter, butter, palm oil, palm kernel oil, hydrogenated oils, and mixtures thereof can be used in amounts up to about 40 weight percent of the fat in the moisture barrier. These fats typically are not a liquid at 40 °F (4 °C).

In one embodiment, about 82 to about 86 weight percent of the fat in the moisture barrier is a food oil, a medium chain length triglyceride, or mixture thereof that is a liquid when stored at 40 °F (4 °C). Additionally, about 14 to about 18 weight percent of the fat in the moisture barrier is from coconut oil, cocoa butter, butter, palm oil, palm kernel, hydrogenated oil, or mixture thereof.

Although the moisture barrier can be 100 percent fat, other ingredients are generally added to improve the appearance and organoleptic characteristics. The moisture barrier can contain edible protein from either an animal or vegetable source. In one embodiment, the protein is from dry milk based ingredients. The dried milk based protein can be obtained from, for example, condensed milk, skim milk, condensed skim milk, lactose-reduced skim milk, and a combination thereof. The skim milk can be ultra-filtered to concentrate the amount of protein in the milk. Ultra-filtered skim milk typically concentrates the protein by a factor of about five (5X skim milk). The milk can come from, for example, cows, goats, or sheep. In one embodiment of the invention, the moisture barrier includes about 3 to about 6 weight percent dried milk.

The moisture barrier can further comprise various disaccharides such as, for example, lactose and sucrose. Other sweeteners can be added. In one embodiment, the moisture barrier contains less than about 10 weight percent sucrose.

5 The moisture barrier can further comprise a flavoring, a colorant, a spice, cocoa, chocolate liqueur, ground coffee, an emulsifying agent such as lecithin, or a mixture thereof.

In other embodiments of the invention, the moisture barrier contains about 10 20 to about 60 weight percent of a confectionary coating. Additionally, the moisture barrier contains about 40 to about 80 weight percent fat that is a liquid at 40 °F (4 °C) and that is from a source other than the confectionary coating.

As used herein, the term "confectionary coating" refers to a composition that 15 contains cocoa butter in an amount not less than about 5 weight percent, fat in an amount not less than about 40 weight percent, sugar in an amount not greater than about 55 weight percent, and moisture in an amount less than about 1 weight percent based on the weight of the confectionary coating. Suitable confectionary coatings include, for example, white chocolate coatings, dark chocolate coatings, milk chocolate coatings, buttermilk chocolate coatings, skim milk chocolate coatings, or mixtures thereof. The confectionary coating can be sweet, semi-sweet, or bittersweet.

20 In one embodiment, the confectionary coating is a white chocolate coating. Suitable white chocolate coating typically contain about 40 to about 60 weight percent fat. Some, but not all, of the fat in the white chocolate coating is a liquid at 40 °F (4 °C). In one embodiments, the white chocolate coating contains about 45 to about 55 weight percent fat, about 3 to about 7 weight percent protein, about 5 to 25 about 10 weight percent lactose, and about 30 to about 35 weight percent sucrose. Such white chocolate coatings can be obtained from Barry Callebaut of St. Albans, VT prepared from sugar, cocoa butter, coconut oil, whole milk powder, soybean oil, skim milk powder, soya lecithin, and vanilla extract.

30 Moisture barriers having about 10 to about 20 weight percent confectionary coating tend to harden into a layer with large cracks. On the other hand, moisture barriers having more than about 60 weight percent confectionary coating tend to harden into a layer that pulls away from the sides of the container leaving some of the frozen dessert not covered by the moisture barrier.

35 In some embodiments, the moisture barrier contains confectionary coating in an amount of about 25 to about 35 weight percent and fat in an amount of about 65 to about 75 weight percent based on the weight of the moisture barrier. The moisture barrier can contain confectionary coating in an amount of about 30 weight percent and fat in an amount of about 70 weight percent based on the weight of the

moisture barrier. The fat is from a source other than the confectionary coating and is liquid at 40 °F (4 °C).

One of the primary functions of the moisture barrier is to minimize contact of the glassy matrix topping and the frozen dessert during storage. If the moisture level 5 in the glassy matrix topping exceeds about 6 weight percent, the glassy matrix topping tends to lose crispiness. If the moisture level in the glassy matrix topping exceeds about 15 weight percent, the glassy matrix topping tends to become syrupy or dissolve.

The sweet, glassy matrix topping is placed over the moisture barrier and is 10 separated from the frozen dessert by the moisture barrier. As used herein, the term "glassy matrix topping" refers a topping having a glassy matrix. As used herein, the phrase "glassy matrix" refers to a material prepared by forming a melt from sucrose, a polysaccharide having an average degree of polymerization of about 2 to about 4, or a mixture thereof. As used herein, the phrase "glassy phase" refers a material 15 having an amorphous rather than crystalline structure. The glassy phase is typically hard and brittle. In some embodiments, the glassy matrix further comprises crystalline material such as crystalline sucrose embedded into the glassy phase material. The glassy matrix topping can further comprise a glassy matrix coating. As used herein, the phrase "glassy matrix coating" refers to a coating covering at 20 least one surface of a glassy matrix.

Figure 2 shows a schematic of one embodiment of a glassy matrix topping 100 in a cross-sectional side view. The glassy matrix 110 is surrounded on all sides by a glassy matrix coating 120. The dimensions of the various components are not drawn to scale.

25 The thickness of the glassy matrix topping is typically in the range of about 1 mm to about 3 mm. Thinner toppings can be difficult to manufacture and tend to be less stable. On the other hand, thicker toppings are more difficult to chew by the consumer.

30 The glassy matrix comprises sucrose, a polysaccharide having an average degree of polymerization of about 2 to about 4, or a mixture thereof. As used herein, the terms "degree of polymerization" or "DP" refer to the number of saccharide units combined in the polysaccharide. Suitable polysaccharides include, for example, a corn syrup, a polydextrose, a partially hydrolyzed inulin, a partially hydrolyzed guar gum, or a mixture thereof. Suitable corn syrups have a dextrose equivalent value of 35 about 30 to about 50. High maltose corn syrup can be used.

As used herein, the phrases "dextrose equivalent value" and "DE value" refer to a measure of the reducing sugar content calculated as percent dextrose. The DE value and the DP are both a measure of the molecular weight of the polysaccharide.

For example, a corn syrup having a DE value of 50 has a lower molecular weight and is sweeter than a corn syrup having a DE value of 30. A polysaccharide having an average DP of 2 has a lower molecular weight and is sweeter than a polysaccharide having an average DP of 4.

5 As used herein, the term "polydextrose" refers to a synthetic material containing multiple dextrose (glucose) units. The material typically contains small amounts of citric acid esters.

The suitability of a glassy matrix topping for a frozen dessert product depends on a number of factors including appearance, stickiness, crispiness, 10 brittleness, transparency, and taste. Preferably, the glassy matrix is sweet, non-sticky, and brittle. The stickiness, crispiness, and brittleness can be related to the hygroscopic tendencies of the glassy matrix. A suitable glassy matrix is stable; as used herein, the term "stable" refers to a glassy matrix topping that picks up less than about five weight percent moisture during storage for five months at -10 °F 15 (-23 °C) with a moisture barrier of the invention placed between the glassy matrix topping and the frozen dessert.

The glassy matrix is prepared by heating sucrose, a polysaccharide having an average DP of about 2 to about 4, or a mixture thereof above the melting point. The melt is cooled to form a viscous syrup and then a glassy phase. The processing 20 temperature required to form a melt is related to the dextrose equivalent value, the degree of polymerization, or the molecular weight of the materials in the glassy matrix. Sucrose can be processed at a lower temperature than polysaccharides such as corn syrup, polydextrose, partially hydrolyzed inulin, and partially hydrolyzed guar gums. A higher processing temperature is required as the molecular weight of 25 the polysaccharide increases. Thus, a glassy matrix topping made from a 42 DE corn syrup can be processed at a lower temperature than a 36 DE corn syrup. Similarly, a glassy matrix topping made with partially hydrolyzed inulin having an average degree of polymerization of 2 can be processed at a lower temperature than a partially hydrolyzed inulin having a degree of polymerization of 4.

30 A suitable glassy matrix topping can be made from sucrose. Such a topping is sweet and can be stable with a good moisture barrier in place. However, glassy phase sucrose tends to adsorb moisture readily. If the moisture barrier is ineffective, a sucrose glassy matrix tends to be unstable. The stability can be improved by coating the sucrose glassy matrix with a glassy matrix coating.

35 A polysaccharide having an average degree of polymerization of about 2 to about 4 can also be used to prepare a suitable glassy matrix without the addition of sucrose. The polysaccharide can include corn syrup having a DE value of about 30 to about 50, polydextrose, partially hydrolyzed inulin, partially hydrolyzed guar

gum, or a mixture thereof. In some embodiments, the polysaccharide is a corn syrup having a DE value of 42 or 36.

A polysaccharide having an average degree of polymerization less than about 2, corresponding to a corn syrup having a dextrose equivalent value greater than about 50, tends to be too hygroscopic. A glassy matrix prepared from such materials tends to be sticky. On the other hand, a polysaccharide having an average degree of polymerization greater than about 4, corresponding to corn syrup or polydextrose having a dextrose equivalent value less than about 30, tend to result in a glassy matrix that is hard to chew and that can stick to the teeth of a consumer.

Corn syrup, polydextrose, and partially hydrolyzed inulin are commercially available as either liquids with about 18 to about 22 weight percent water or as solids with about 5 weight percent water. Either the liquid or the solid can be used. Boiling or evaporation is used to remove the water during formation of the glassy matrix topping.

A glassy matrix can be prepared from sucrose in combination with a polysaccharide having an average DP of about 2 to about 4. A mixture of polysaccharides can be used. Any amount of sucrose can be included. Sucrose lowers the required processing temperature of the glassy matrix and improves the sweetness of the topping. A glassy matrix topping with a high concentration of sucrose tends be sticky because glassy phase sucrose readily adsorbs moisture. However, if a crack-free moisture barrier is in place that completely covers all exposed surfaces of the frozen dessert, high concentrations of non-crystalline sucrose can be used in the glassy matrix topping. As used herein, the phrase "exposed surface" refers to a surface of the frozen dessert that is not in contact with a bottom or a sidewall of a container holding the frozen dessert.

Any of the above mentioned glassy matrix toppings can contain crystalline materials such as crystalline sucrose. Crystalline sucrose has a low tendency to pick up moisture and can increase the stability of the glassy matrix topping. Sucrose crystals are embedded in the glassy phase of the glassy matrix. There is no lower limit to the amount of crystalline sucrose that can be added. However, if too much crystalline sucrose is added, the glassy matrix topping will not be brittle. As used herein, the term "brittle" refers to a glassy matrix topping that is readily broken. In some embodiments, the brittle topping shatters when broken. A non-brittle topping typically will not shatter.

In some embodiments of a glassy matrix with embedded crystalline sucrose, the glassy matrix contains crystalline sucrose in an amount of about 20 to about 60 weight percent based on the weight of the glassy matrix. Additionally, the glassy matrix contains about 40 to about 80 weight percent of a glassy phase comprising

sucrose, a polysaccharide having an average DP of about 2 to about 4, or a combination thereof. In one example, the glassy phase contains corn syrup having a DE value of 42 in an amount of about 40 to about 80 weight percent based on the weight of the glassy matrix. In another example, the glassy phase contains corn
5 syrup having a dextrose equivalent value of 42 in an amount of about 20 to about 80 percent and sucrose in an amount up to about 20 weight percent based on the weight of the glassy matrix.

The glassy matrix can further comprise flavorants, colorants, non-nutritive sweeteners, or combinations thereof.

10 The glassy matrix topping can comprise a glassy matrix and a glassy matrix coating covering at least one surface of the glassy matrix. In some embodiments, the glassy matrix coating covers all surfaces of the glassy matrix. The thickness of the glassy matrix coating typically ranges from about 0.05 mm to about 0.5 mm. The glassy matrix coating is typically added to the glassy matrix to prepare a glassy
15 matrix topping with improved stability. In some embodiments, the glassy matrix coating is transparent and not discernible to the consumer. In other embodiments, the glassy matrix coating is opaque.

A transparent glassy matrix coating is prepared, for example, from various food oils, an edible shellac, an acetylated monoglyceride, a Salatrim modified fat, or
20 a mixture thereof. Suitable food oils include soybean oil, canola oil, cottonseed oil, peanut oil, safflower oil, corn oil, or mixtures thereof. As used herein, the term "Salatrim" is an acronym for short and long-chain acyl triglyceride molecule. Salatrim typically contains about 30 to 67 mole percent short-chain fatty acids and about 33 to 70 mole percent long-chain fatty acids.

25 Any of the formulations used to prepare the moisture barrier can be used to as a glassy matrix coating. The formulations containing confectionary coatings are usually opaque.

Further, any of the formulations of the glassy matrix coating can contain up to about 1 weight percent emulsifier. Suitable emulsifiers include, for example,
30 lecithin and polyglycerol esters of fatty acids. The emulsifiers can improve the flow properties of the glassy matrix coating and can alter how the fat in the glassy matrix coating crystallizes.

The glassy matrix topping can have any shape but the shape typically conforms to that of a container for the frozen dessert product. The glassy matrix
35 topping generally has dimensions smaller than the container and does not contact an inner surface of the container sidewalls.

Another aspect of the invention provides a method of preparing a frozen dessert product having a sweet, thin, crunchy, and brittle topping. The method

comprises (a) covering at least one surface of the frozen dessert with a moisture barrier; and (b) placing a thin, sweet, glassy matrix topping over the moisture barrier.

In one embodiment, the frozen dessert is not in a container. The frozen dessert can be, for example, in the shape of a disk, rectangle, cylinder, or cube. All the sides of the frozen dessert or all the sides of the frozen dessert but the bottom surface are covered with the moisture barrier. The glassy matrix topping is placed over the moisture barrier on one surface of the frozen dessert.

In other embodiments, the frozen dessert is placed in a disposable container at a temperature such that the frozen dessert conforms to the shape of a container. Only the top surface of the frozen dessert is not in contact with either the bottom or sidewalls of the container. The moisture barrier completely covers the top surface of the frozen dessert and extends to contact the inner surfaces of the container sidewalls. The glassy matrix topping is placed over the moisture barrier and is separated from the frozen dessert by the moisture barrier.

The frozen dessert usually can be extruded into a container at a temperature close to about 20 °F (-7 °C). The temperature of the frozen dessert should be warm enough to allow the frozen dessert to flow resulting in a flat top surface. The frozen dessert can conform to the shape of the container such that the only surface of the frozen dessert not in contact with the container is the top surface.

The moisture barrier is typically fluid when applied to the frozen dessert and spreads easily and evenly over any exposed surface of the frozen dessert to completely cover the surface. The moisture barrier then hardens slowly upon contact with the frozen dessert. If the moisture barrier hardens too rapidly, obtaining complete coverage of an exposed surface of the frozen dessert can be difficult. When the frozen dessert is in a container, the moisture barrier preferably hardens such that the moisture barrier does not pull away from the inner surfaces of the container sidewalls leaving a portion of the frozen dessert near the container sidewalls uncovered by the moisture barrier. The hardened moisture barrier preferably totally covers all surfaces of the frozen dessert that are not in contact with the container and contacts the inner surface of the container sidewalls.

The moisture barrier can be applied to the exposed surfaces of the frozen dessert using any suitable method such as spraying, spreading, or flowing. The thickness typically is about 1 to about 3 mm. In one embodiment, the frozen dessert is in a container and the moisture barrier is added to the center of the exposed top surface of the frozen dessert. The container is rotated to spread the moisture barrier evenly over the top surface of the frozen dessert and contact the inner surfaces of the container sidewalls with the moisture barrier.

The moisture barrier comprises at least 70 weight percent fat based on the weight of the moisture barrier. At least 60 percent of the fat in the moisture barrier is liquid when stored at 40 °F (4 °C). The moisture barrier is prepared by mixing the fat and other ingredients at a temperature high enough to form a fluid composition.

- 5 Typically, the moisture barrier is formed at a temperature in the range of about 90 °F (32 °C) to about 100 °F (38 °C) and applied to the frozen dessert when the moisture barrier composition is at a temperature of about 70 °F (21 °C) to about 90 °F (32 °C).

If the moisture barrier is applied at a temperature of about 70 °F (21 °C) to about 90 °F (32 °C) and the frozen dessert is hard, little melting of the frozen dessert occurs. However, if higher application temperatures are used, some of the frozen dessert can melt. Excessive melting of the frozen dessert tends to result in a moisture barrier having unacceptable moisture content. The moisture content is preferably less than about 1 weight percent.

10 The glassy matrix topping is typically prepared prior to being placed on the moisture barrier covering the exposed surfaces of the frozen dessert. The glassy matrix topping is prepared by forming a melt containing sucrose, a polysaccharide having an average DP or about 2 to about 4, or a combination thereof. As used herein, the term "melt" refers to a fluid essentially free of water formed above the melting point of sucrose, corn syrup, polydextrose, partially hydrolyzed inulin, or 20 combination thereof. Boiling or evaporation during the process of forming the melt can be used to remove any water present in the sucrose or polysaccharide because boiling occurs at a lower temperature than melting.

In one embodiment, the melt is spread to a thickness of about 1 mm to about 3 mm on a flat surface and then cooled to form a viscous syrup. The viscous syrup 25 is then cut to the desired size and shape before it hardens to form a glassy matrix. In one embodiment, the viscous syrup is cut to a shape conforming to that of the container. The size is generally selected to be smaller than the container so that the glassy matrix topping does not touch the inner surface of the container sidewalls.

The melt can also be placed in a shallow mold. The thickness of the melt in 30 the mold is about 1 mm to about 3 mm. The melt is cooled to form a viscous syrup and then a glassy matrix. The glassy matrix is separated from the mold. The shape of the mold can conform to the shape of the container for the frozen dessert product. Typically, the size of the mold is selected so that the glassy matrix topping does not touch the inner surface of the container sidewalls.

35 Crystalline sucrose can be embedded into the glassy matrix when the composition is viscous syrup. Suitable crystalline sucrose includes medium or coarse grain sugar. In some embodiments the crystalline sugar is tinted brown. The crystalline sucrose is added at a temperature below its melting point. The melting

point is usually close to about 374 °F (190 °C) but some melting can occur at lower temperatures. The crystalline sucrose usually can be added at about 340 °F (171 °C).

In some embodiments, the glassy matrix is coated with a glassy matrix coating. The thickness of the glassy matrix coating is about 0.05 mm to about 0.5 mm. The glassy matrix coating is a solid at the temperatures used to store the frozen dessert product and can be either transparent or opaque.

A transparent coating can be prepared from a food oil, an edible shellac, beeswax, an acetylated monoglyceride, a Salatrim modified fat, or a mixture thereof. Suitable food oils include, for example, soybean oil, canola oil, cottonseed oil, peanut oil, safflower oil, corn oil, or a mixture thereof.

A glassy matrix coating can be prepared using any of the formulations described above for the moisture barrier. The formulations containing confectionary coatings are usually opaque.

The glassy matrix coating can be applied by any known method including, for example, dipping, flowing, or spraying. The glassy matrix coating is applied at a temperature high enough to form a fluid coating composition but not high enough to melt the glassy matrix. For example, the glassy matrix coating can be prepared at a temperature in the range of about 90 °F (32 °C) to about 100 °F (38 °C) and applied to the glassy matrix at a temperature of about 70 °F (21 °C) to about 90 °F (32 °C).

The glassy matrix coating can be applied to one or all surfaces of the glassy matrix. In one embodiment, the glassy matrix coating covers all surfaces of the glassy matrix. To prepare such a glassy matrix topping, the glassy matrix can be dipped in the glassy matrix coating. The coating is fluid when applied and solidifies upon cooling.

In other embodiments, the glassy matrix coating covers only the surfaces of the glassy matrix that are not in contact with the moisture barrier. To prepare a glassy matrix topping coated on one side, the coating composition can be applied, for example, by placing glassy matrix coating composition near the center of the surface to be coated. The glassy matrix can be rotated to spread the glassy matrix coating composition uniformly over the surface of the glassy matrix. The coating is fluid when applied and solidifies upon cooling.

A frozen dessert product having the glassy matrix coating on only one surface of the glassy matrix can also be prepared, for example, by placing a glassy matrix over the moisture barrier and spraying the glassy matrix coating to cover the glassy matrix.

The frozen dessert product of the invention has a topping that does not dissolve upon extended storage but remains crunchy, brittle, and non-sticky. The glassy matrix topping usually retains low moisture levels upon extended storage of

the frozen dessert product at freezer temperatures. Preferably, the glassy matrix picks up less than about 5 weight percent moisture upon storage for five months at -10 °F (-23 °C) when a moisture barrier of the invention is present to separate the frozen dessert from the glassy matrix topping. Preferably, there are no cracks in the 5 moisture barrier or the glassy matrix coating.

Another aspect of the invention provides a moisture barrier for frozen desserts. The moisture barrier can be used with other types of frozen dessert products than those having a sweet, glassy matrix topping. For example, the moisture barrier could be used to separate a frozen dessert from other types of 10 toppings such as chocolate, fruit flavored, butterscotch, and caramel. The moisture barrier can also be used on a frozen dessert having no topping.

The moisture barrier comprises at least 70 weight percent fat based on the weight of the moisture barrier. At least 60 weight percent of the fat is liquid at 40 °F (4 °C). Fats that are liquids at 40 °F (4 °C) include, for example, a food oil, a 15 medium chain length triglyceride, or a mixture thereof. Suitable food oils include, for example, soybean oil, cottonseed oil, canola oil, safflower oil, corn oil, peanut oil, or a mixture thereof.

The moisture barrier can contain up to 40 weight percent of fat that is not liquid at 40 °F (4 °C). Suitable fats include, for example, coconut oil, cocoa butter, 20 butter, palm oil, palm kernel oil, hydrogenated oil, or a mixture thereof.

In one embodiment of the moisture barrier, about 82 to about 86 weight percent of the fat is a food oil, a medium chain length triglyceride, or mixture thereof that is a liquid when stored at 40 °F (4 °C). Suitable food oils that are not a liquid at 40 °F (4 °C) include soybean oil, cottonseed oil, peanut oil, sunflower oil, 25 safflower oil, corn oil, canola oil, and the like. Additionally, about 14 to about 18 weight percent of the fat in the moisture barrier is from coconut oil, cocoa butter, butter, palm oil, palm kernel, hydrogenated oil, or mixture thereof in an amount of based on the weight of the fat.

In another embodiments of the moisture barrier, the moisture barrier contains 30 about 20 to about 60 weight percent of a confectionary coating. Additionally, the moisture barrier contains about 40 to about 80 weight percent fat that is a liquid at 40 °F (4 °C) and that is from a source other than the confectionary coating.

In one embodiment, the moisture barrier contains confectionary coating in an amount of about 25 to about 35 weight percent and fat in an amount of about 65 to 35 about 75 weight percent based on the weight of the moisture barrier. For example, the moisture barrier can contain confectionary coating in an amount of about 30 weight percent and fat in an amount of about 70 weight percent based on the weight

of the moisture barrier. The fat is from a source other than the confectionary coating and is liquid at 40 °F (4 °C).

Another aspect of the invention provides a glassy matrix topping comprising a glassy matrix. In one embodiment the glassy matrix contains embedded crystalline sucrose in an amount of about 20 to about 60 percent by weight based on the weight of the glassy matrix and a glassy phase in an amount of about 40 to about 80 percent by weight based on the weight of the glassy matrix. The glassy phase comprises sucrose, a polysaccharide having an average DP of about 2 to about 4, or a mixture thereof. In one example, the glassy phase comprises corn syrup having a DE value of 42. In another example, the glassy phase contains sucrose in an amount up to about 20 weight percent based on the weight of the glassy matrix and corn syrup having a DE value of 42 in an amount of about 20 to about 80 weight percent based on the weight of the glassy matrix.

In another embodiment, the glassy matrix topping comprises a glassy matrix and a glassy matrix coating. The glassy matrix comprises sucrose, a polysaccharide having an average DP of about 2 to about 4, or a mixture thereof. The glassy matrix coating covers at least one surface of the glassy matrix. The glassy matrix can include embedded crystalline sucrose.

A transparent glassy matrix coating can be prepared, for example, from a food oil, an edible shellac, beeswax, an acetylated monoglyceride, a Salatrim modified fat, or a mixture thereof. Suitable food oils include, for example, soybean oil, canola oil, cottonseed oil, peanut oil, sunflower oil, corn oil, or a mixture thereof.

The formulations used to prepare the moisture barrier can be used for the glassy matrix coating. A coating that includes a confectionary coating is usually opaque.

The following examples further describe the various compositions and methods of the invention. The examples are provided for exemplary purposes to facilitate understanding of the inventions and should not be considered to limit the invention to the examples.

EXAMPLES

Example 1

35 Preparation of Moisture Barrier

Moisture barriers (**Examples 1a, 1b, 1c, and 1d**) were prepared according to the claims of the invention by mixing various fat compositions with a white chocolate coating. The white chocolate coating, obtained from Barry Callebaut of

St. Albans, VT, contained sugar, cocoa butter, coconut oil, whole milk powder, soybean oil, skim milk powder, soya lecithin, and vanilla extract. The white chocolate contains 52 ± 3 weight percent fat and less than 1 weight percent moisture. About 85 percent of the particles in the white chocolate coating were less than 30 microns.

The compositions of the moisture barriers are shown in Table 1.

Table 1: Composition of Moisture Barriers

	Example 1A	Example 1B	Example 1C	Example 1D	Example 1E
Cottonseed oil, wt. %	70	71	71	74	72
White chocolate coating, wt. %	30	25	25	20	20
Cocoa butter, wt. %		1.5	2.5	3.5	4.5
Coconut oil, wt. %		2.5	1.5	2.5	3.5

10 The chemical analysis of the moisture barriers are in Table 2.

Table 2: Chemical Analysis of the Moisture Barriers

	Example 1A	Example 1B	Example 1C	Example 1D	Example 1E
Sucrose, wt. %	9.7	8.1	8.1	6.5	6.5
Fat, wt. %	85.6	88.0	88.0	90.4	90.4
Lactose, wt. %	2.2	1.8	1.8	1.4	1.4
Protein, wt. %	1.6	1.3	1.3	1.1	1.1

15 The fats and the white chocolate coating were mixed together and heated to form a fluid composition at 95 °F (35 °C) to 100 °F (38 °C).

Comparative Example 1 **Preparation of Moisture Barrier**

A moisture barrier having a fat content outside the range of the invention was 20 prepared as described in Table 3.

Table 3: Composition of Comparative Moisture Barrier

	Comparative Example 1
Cottonseed oil, wt. %	39
Coconut oil, wt. %	21
Ground sugar, wt. %	24
Cocoa solids, wt. %	6
Dried milk solids, wt. %	10
Total, wt. %	100

The sucrose was ground in a water cooled micro mill (available from Technilab Instruments; Pequannock, NJ). All the ground sucrose passed through a 270 mesh screen (53 microns) and a majority of the ground sucrose passed through a 325 mesh screen (44 microns). The ground sucrose was stored in a 53 percent
5 humidity chamber for three days to crystallize all amorphous surfaces. The sucrose was then stored in a desiccator over anhydrous calcium sulfate.

The cocoa solids, obtained from Barry Callebaut of St. Albans, VT, contained less than 1 weight percent fat. At least 99.5 weight percent of the cocoa solids passed through a 200 mesh screen (75 microns).

10 The nonfat dried milk contained 35 weight percent protein, 4 weight percent moisture, 52 weight percent lactose, and a maximum of 1.25 weight percent fat. The dried milk was ground with a mortar and pestle to reduce the particle size.

15 The oils were mixed together and warmed to 30 °C. Ground sugar, cocoa solids, and dried milk powder were stirred into the oil. The mixture was placed in a micro mill for five minutes or more to make the coating smooth. After milling, most particles remained suspended.

Example 2

Preparation of Glassy Matrix Topping

20 Aluminum foil was placed on a flat baking sheet having sides. The aluminum foil was sprayed lightly with oil. A thin layer of sucrose was sprinkled on the aluminum foil covered baking sheet. The baking sheet was then placed in an oven at 450 °F (232 °C). The sucrose melted and turned brown. The melt was removed from the oven and cooled to a viscous syrup.

25 A 2.1 inch (5.4 cm) diameter round cutter was pressed into the hot, viscous sucrose syrup. The round cutter left an impression and scored the material. Upon further cooling, the viscous syrup became a glassy matrix. After the glassy matrix was completely cooled, the sides around the score were broken off resulting in the production of a sucrose glassy matrix disk.

30 The weight of the glassy matrix disks varied from about 4.2 to about 5.2 grams.

The glass matrix disks were stored in a covered container to keep out moisture.

Example 3**Evaluation of Moisture Barriers at 20 °F (-7 °C) Ice Cream
with Storage at -10 °F (-23 °C)**

The frozen dessert used was vanilla ice cream hardened in a 4.2 fluid ounce
5 cup with about 1 centimeter headspace. The ice cream was leveled in the cup.

The ice cream was placed in a freezer at 20 °F (-7 °C) overnight with a lid
over each cup. The lids were removed from the cup and wiped to removed moisture.
The moisture barrier was applied by warming the coatings prepared in Example 1
and Comparative Example 1 to about 90 °F (32 °C) in a microwave. About 3.5 g of
10 the coating was weighed and poured over the top of the ice cream. The temperature
of the coating was about 80 °F (27 °C) when applied to the ice cream. The cup was
rotated quickly so the coating spread evenly on the ice cream surface. A spoon was
used, if needed, to spread coating onto any uncoated areas. The top surface of the
ice cream was completely covered with the moisture barrier. Each moisture barrier
15 was applied to two ice cream samples. The repeated samples are labeled as "X-1"
and "X-2" where X is 1A, 1B, 1C, 1D, 1E, and Comparative 1.

The coated ice cream was covered with a lid and placed in a blast freezer
held at -40 °F (-40 °C) for one hour to harden the coating. This simulates
temperature gradients a product might encounter during manufacturing. The product
20 was removed from the blast freezer and stored temporarily at 0 °F (-18 °C). The
glassy matrix disks prepared as described in Example 2 were weighed to the nearest
0.0001 gram. A glassy matrix disk was placed over the moisture barrier in each cup.
The product was stored at -10 °F (-23 °C). The glassy matrix disk was re-weighed
and the percent weight gain calculated after storage for 30, 71, and 139 days. The
25 weight gain relates to the amount of moisture the glassy matrix adsorbed over time.
The data is shown in Table 4.

Table 4: Weight Gain of Glassy Disks - 30 days at -10 °F (-23 °C)

<u>Example</u>	<u>Wt. % Gain after 30 days</u>	<u>Wt. % Gain after 71 days</u>	<u>Wt. % Gain after 139 days</u>
1A-1	0.8	1.7	3.5
1A-2	0.5	1.1	1.7
1B-1	0.6	1.2	2.0
1B-2	0.5	1.0	1.5
1C-1	0.7	1.2	1.6
1C-2	0.4	0.9	1.4
1D-1	0.6	1.1	1.7
1D-2	0.6	1.1	1.8
1E-1	0.7	1.5	3.2
1E-2	0.8	1.3	1.9
Comparative 1-1	2.2	4.7	8.0
Comparative 1-2	2.0	4.3	6.6

The comparative example coatings cracked after blast freezing and the glassy disk above these coating picked up the most moisture.

Example 4

5

Preparation of Glassy Matrix Topping

Made from 42 DE Corn Syrup and Crystalline Sucrose

The combination of 42 DE corn syrup and sucrose were used to prepare a glassy matrix. The corn syrup was Staley's 7300 Neto 42 DE corn syrup available from A. E. Staley Manufacturing Co. in Decatur, IL. The corn syrup contained 10 19.6% moisture. Sucrose and corn syrup were mixed such that the weight ratio of sucrose to corn syrup solids was about 1:9 (sucrose: corn syrup solids). The mixture was heated until the sucrose dissolved.

15 The mixture was spread thin onto an oiled, foil-lined baking sheet. The baking sheet was then placed in an oven at 375 °F (191 °C). The syrup boiled and the water was removed. The mixture turned slightly brown. The melt was removed from the oven and cooled to form a viscous syrup.

20 A 2.1 inch (5.4 cm) diameter cutter was pressed into the hot, viscous sucrose syrup, leaving an impression or a score. Upon further cooling, the viscous syrup became a glassy matrix. After the glassy matrix was completely cooled, the sides around the score were broken off resulting in the production of a glass matrix disk.

25 Glassy matrix disks weighing in the range of 3.8 grams to 4.5 grams were selected and placed on a oiled, foil lined pan. The pan containing the glassy matrix disks was placed in a 360°F (182°C) oven and the glassy matrix disks were melted again. The disks melted in about 4 minutes. The pan was removed from the oven and about 1 gram of large sanding sugar (crystalline sucrose) was sprinkled onto each of the melted disk in the pan. The pan was then put back in the oven for another 3 minutes. The pan was removed from the oven and the sucrose crystals were pressed into the melted disks with a piece of flattened metal. The pan was returned to oven for 3 minutes. After removal of the pan from the oven, the samples 30 were cooled to a viscous syrup and then pressed with a cutter. After cooling, the edges were broken away to produce a 2.5 cm diameter glassy matrix disc containing about 20 weight percent embedded crystalline sucrose. The glassy phase of the glassy matrix is about 90 weight percent 42 DE corn syrup and about 10 weight percent sucrose.

35

Example 5

Evaluation of Glasses, Coatings and Moisture Barriers

Applied to 0 °F (-18 °C) Ice Cream with Storage at 0 °F (-18 °C)

The frozen dessert used was vanilla ice cream hardened in a 4.2 fluid ounce
5 cup with about 1 centimeter headspace and having a leveled ice cream surface.

The moisture barrier was applied by warming a compositions of Example 1A and Comparative Example 1 to about 95 °F (35 °C). About 3.5 g of the moisture barrier was poured at 80 °F (27 °C) over the top of the ice cream that was at about 0 °F (-18 °C). The cup was rotated quickly so the coating was spread evenly on the ice
10 cream surface. A spoon was used, if needed, to spread coating onto any uncoated areas. The top surface of the ice cream was completely covered with the moisture barrier. The ice cream with moisture barrier was placed in a 0 °F (-18 °C) freezer to harden the moisture barrier for several hours.

The glass matrix disks were those prepared in Examples 2 and 4. The glass
15 matrix disks were weighed to the nearest 0.0001 gram. All discs weighed between 4.3 and 5.0 grams. Some disks were dipped in a shellac coating (Capol 153D provided by CenterChem, Inc of Stamford, CT). These disks were then drained, dried and reweighed. The coating weighed 0.10 -.12 g. A weighed glassy disk was placed onto the ice cream coated with a moisture barrier and covered with a tight
20 fitting lid. Duplicate samples were made of each variable. The product was placed in a freezer set at 0 °F (-18 °C) for storage. The glassy disks were weighed periodically to determine how much moisture was picked up. The data is shown in Table 5.

Table 5: Averaged Weight Gain of Two Glassy Disks at 0 °F (-18 °C)

<u>Example</u>	<u>Barrier</u>	<u>Glass matrix composition</u>	<u>Glass Coating</u>	<u>30 days</u>	<u>71 days</u>	<u>139 days</u>	<u>214 days</u>	<u>301 days</u>
Comp. Ex. 5	Comp. Ex. 1	Example 2	None	3.1%	6.2%	11.4%		
Example 5-1	Example 1A	Example 2	None	1.1%	2.0%	4.0%	6.3%	9.7%
Example 5-2	Example 1A	Example 2	Shellac	0.6%	1.2%	2.1%	3.5%	5.2%
Example 5-3	Example 1A	Example 4	None	0.9%	1.6%	3.1%	5.2%	7.8%
Example 5-4	Example 1A	Example 4	Shellac	0.5%	1.1%	2.0%	3.4%	5.1%

25

The amount of weight gain related to the amount of moisture adsorbed by the glassy matrix topping. The lower the amount of moisture adsorbed, the better the stability of the frozen dessert product. Frozen dessert products having a moisture barrier that is not in accord with the claims of the present invention (Comparative
30 Example 5) are not stable. The glassy matrix coating picked up large amounts of moisture resulting from the visible cracks in the moisture barrier.

A glassy matrix topping having a glassy matrix prepared from only sucrose and having no glassy matrix topping picked up more moisture than a glass matrix

topping prepared from a mixture of sucrose and corn syrup. Adding a glassy matrix coating to the glassy matrix improved the stability of the product.

From the foregoing detailed description, it will be evident that modification can be made in the composition and methods of the invention without departing
5 from the spirit or scope of the invention. Therefore, it is intended that all modifications and variations not departing from the spirit of the invention come within the scope of the claims and their equivalents.

WE CLAIM:

1. A composition comprising:
 - (a) a frozen dessert;
 - 5 (b) a moisture barrier covering at least one surface of the frozen dessert; and
 - (c) a sweet, glassy matrix topping placed over the moisture barrier, the glassy matrix topping comprising a glassy matrix.
- 10 2. The composition of claim 1, wherein the frozen dessert comprises frozen custard, ice cream, ice milk, gelato, milk shakes, frozen yogurt, pudding, sherbet, or sorbet.
- 15 3. The composition of claim 1, wherein the moisture barrier comprises fat in an amount of at least 70 weight percent based on the weight of the moisture barrier, wherein at least 60 weight percent of the fat is liquid when stored at 40 °F (4 °C).
4. The composition of claim 3, wherein the fat that is liquid when stored at 40 °F (4 °C)
- 20 comprises a food oil, a medium chain length triglyceride, or a mixture thereof.
5. The composition of claim 4, wherein the food oil is soybean oil, cottonseed oil, peanut oil, sunflower oil, safflower oil, corn oil, canola oil, or a mixture thereof.
- 25 6. The composition of claim 3, wherein the fat contains up to 40 weight percent coconut oil, cocoa butter, butter, palm oil, palm kernel oil, hydrogenated oils, or mixtures thereof.
7. The composition of claim 3, wherein the fat comprises
 - 30 (a) a food oil, medium chain length triglyceride, or mixture thereof that is a liquid when stored at 40 °F (4 °C) in an amount of about 82 to about 86 weight percent based on the weight of the fat; and
 - (b) coconut oil, cocoa butter, butter, palm oil, palm kernel, hydrogenated oil, or a mixture thereof in an amount of about 14 to about 18 weight percent based 35 on the weight of the fat.

8. The composition of claim 7, wherein the food oil that is a liquid when stored at 40 °F (4 °C) is soybean oil, cottonseed oil, peanut oil, sunflower oil, safflower oil, corn oil, canola oil, or a mixture thereof.

5 9. The composition of claim 3, wherein the moisture barrier further comprises milk protein.

10. The composition of claim 3, wherein the moisture barrier further comprises one or more disaccharides.

10 11. The composition of claim 3, wherein the moisture barrier further comprises a flavoring, a spice, cocoa, chocolate coating liqueur, ground coffee, an emulsifying agent, or a mixture thereof.

15 12. The composition of claim 1, wherein the moisture barrier comprises
(a) confectionary coating in an amount of about 20 to about 60 weight percent based on the weight of the moisture barrier; and

20 (b) fat in an amount of about 40 to about 80 weight percent based on the weight of the moisture barrier, wherein the fat is a liquid at 40 °F (4 °C) and the fat is from a source other than the confectionary coating.

13. The composition of claim 12, wherein the moisture barrier contains confectionary coating in an amount of about 25 to about 35 weight percent and fat in an amount of about 65 to about 75 weight percent.

25 14. The composition of claim 12, wherein the moisture barrier contains confectionary coating in an amount of about 30 weight percent and fat in an amount of about 70 weight percent.

30 15. The composition of claim 12, wherein the confectionary coating comprises fat in an amount of about 45 to about 55 weight percent, protein in an amount of about 3 to about 7 weight percent, lactose in an amount of about 5 to about 10 weight percent, and sucrose in an amount of about 30 to 35 weight percent based on the weight of the confectionary coating.

35 16. The composition of claim 12, wherein the confectionary coating is a white chocolate coating, a dark chocolate coating, a milk chocolate coating, a buttermilk chocolate coating, a skim milk chocolate coating, or a mixture thereof.

17. The composition of claim 12, wherein the confectionary coating is a white chocolate coating.
18. The composition of claim 1, wherein the glassy matrix comprises sucrose, a polysaccharide having an average degree of polymerization of about 2 to about 4, or a mixture thereof.
 - 5
19. The composition of claim 18, wherein the polysaccharide is a polydextrose, a partially hydrolyzed inulin, a partially hydrolyzed guar gum, a corn syrup having a dextrose equivalent value of about 30 to about 50, or a mixture thereof.
 - 10
20. The composition of claim 18, wherein the glassy matrix further comprises embedded crystalline sucrose.
 - 15
21. The composition of claim 19, wherein the glassy matrix comprises corn syrup having a dextrose equivalent value of 42.
 - 20
22. The composition of claim 1, wherein the glassy matrix comprises
 - (a) embedded crystalline sucrose in an amount of about 20 to about 60 weight percent based on the weight of the glassy matrix; and
 - (b) a glassy phase in an amount of about 40 to about 80 weight percent based on the weight of the glassy matrix, the glassy phase comprising sucrose, a polysaccharide having an average DP of about 2 to about 4, or a mixture thereof.
23. The composition of claim 22, wherein the glassy phase comprises sucrose in an amount up to about 20 weight percent based on the weight of the glassy matrix and corn syrup in an amount of about 20 to about 80 weight percent based on the weight of the glassy matrix, the corn syrup having a dextrose equivalent value of 42.
 - 25
24. The composition of claim 1, wherein the glassy matrix topping is about 1 mm to about 3 mm thick.
 - 30
25. The composition of claim 1, wherein the glassy matrix topping further comprises a glassy matrix coating covering at least one surface of the glassy matrix.
 - 35
26. The composition of claim 25, wherein the glassy matrix coating comprises a food oil, an edible shellac, beeswax, an acetylated monoglycerides, a Salatrim modified fat, or a mixture thereof.

27. The composition of claim 26, wherein the food oil is soybean oil, canola oil, cottonseed oil, peanut oil, safflower oil, sunflower oil, corn oil, or mixtures thereof.
28. A moisture barrier composition comprising fat in an amount of at least 70 weight percent based on the weight of the moisture barrier, wherein at least 60 weight percent of the fat is liquid when stored at 40 °F (4 °C).
29. The composition of claim 28, wherein the fat that is liquid when stored at 40 °F (4 °C) comprises food oil, a medium chain length triglyceride, or a mixture thereof.
30. The composition of claim 29, wherein the food oil is soybean oil, cottonseed oil, canola oil, safflower oil, sunflower oil, corn oil, peanut oil, or a mixture thereof.
31. The composition of claim 28, wherein the fat contains up to 40 weight percent coconut oil, cocoa butter, butter, palm oil, palm kernel oil, hydrogenated oil, or a mixture thereof.
32. The composition of claim 28, wherein the fat comprises
- (a) a food oil, medium chain length triglyceride, or mixture thereof that is a liquid when stored at 40 °F (4 °C) in an amount of about 82 to about 86 weight percent based on the weight of the fat; and
- (b) coconut oil, cocoa butter, butter, palm oil, palm kernel, hydrogenated oil, or a mixture thereof in an amount of about 14 to about 18 weight percent based on the weight of the fat.
33. The composition of claim 28, wherein the moisture barrier comprises
- (a) confectionary coating in an amount of about 20 to about 60 weight percent based on the weight of the moisture barrier; and
- (b) fat in an amount of about 40 to about 80 weight percent based on the weight of the moisture barrier, wherein the fat is a liquid at 40 °F (4 °C) and the fat is from a source other than the confectionary coating.
34. The composition of claim 33, wherein the moisture barrier contains confectionary coating in an amount of about 25 to about 35 weight percent and fat in an amount of about 65 to about 75 weight percent.

35. The composition of claim 33, wherein the confectionary coating is a white chocolate coating, a dark chocolate coating, a milk chocolate coating, a buttermilk chocolate coating, a skim milk chocolate coating, or a mixture thereof.

5 36. A glassy matrix topping comprising a glassy matrix comprising
 (a) embedded crystalline sucrose in an amount of about 20 to about 60
 weight percent based on the weight of the glassy matrix; and
 (b) a glassy phase in an amount of about 40 to about 80 weight percent
 based on the weight of the glassy matrix, the glassy phase comprising sucrose, a
10 polysaccharide having an average degree of polymerization of about 2 to about 4, or
 a mixture thereof,
 wherein the glassy matrix topping has a thickness of about 1 to about 3 mm.

15 37. The glassy matrix topping of claim 36, wherein the polysaccharide is a
 polydextrose, a partially hydrolyzed inulin, a partially hydrolyzed guar gum, a corn
 syrup having a DE value of about 30 to about 50, or a combination thereof.

20 38. The glassy matrix topping of claim 37, wherein the glassy phase comprises
 corn syrup having a dextrose equivalent value of 42 in an amount of about 40 to
 about 80 weight percent.

25 39. The glassy matrix topping of claim 36, wherein the glassy phase comprises
 sucrose in an amount up to about 20 weight percent based on the weight of the
 glassy matrix and corn syrup in an amount of about 20 to about 80 weight percent
 based on the weight of the glassy matrix, the corn syrup having a dextrose
 equivalent value of 42.

40. A glassy matrix topping comprising
 (a) a glassy matrix comprising a glassy phase comprising sucrose, a
30 polysaccharide having an average degree of polymerization of about 2 to about 4, or
 a mixture thereof; and
 (b) a glassy matrix coating covering at least one surface of the glassy
 matrix,
 wherein the glassy matrix topping has a thickness of about 1 to 3 mm.

35 41. The glassy matrix topping of claim 40, wherein the coating is about 0.05 to
 about 0.5 mm thick.

42. The glassy matrix topping of claim 40, further comprising crystalline sucrose embedded in the glassy phase of the glassy matrix.

43. The glassy matrix topping of claim 40, wherein the glassy matrix coating 5 comprises a food oil, an edible shellac, beeswax, an acetylated monoglycerides, a Salatrim modified fat, or a mixture thereof.

44. The composition of claim 43, wherein the food oil is soybean oil, canola oil, cottonseed oil, peanut oil, safflower oil, sunflower oil, corn oil, or a mixture thereof.

10

45. A method for preparing a frozen dessert product comprising:

(a) covering at least one exposed surface of a frozen dessert with a moisture barrier; and

(b) placing a thin, sweet, glassy matrix topping over the moisture barrier, 15 wherein the glassy matrix topping comprises a glassy matrix.

46. The method of claim 45, wherein the frozen dessert is placed in a disposable container and conforms to the shape of the container.

20

47. The method of claim 46, wherein the moisture barrier covers all surfaces of the frozen dessert not in contact with the disposable container.

48. The method of claim 45, wherein the moisture barrier is applied when it is fluid to the exposed surfaces of the frozen dessert.

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49. The method of claim 45, wherein the moisture barrier comprises fat in an amount of at least 70 weight percent based on the weight of the moisture barrier, wherein at least 60 weight percent of the fat based on the weight of the fat is liquid when stored at 40 °F (4 °C).

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50. The method of claim 45, wherein the moisture barrier is about 1 mm to about 3 mm thick.

51. The method of claim 45, wherein the moisture barrier comprises

(a) confectionary coating in an amount of about 20 to about 60 weight percent based on the moisture barrier; and

(b) fat in an amount of about 40 to about 80 weight percent based on the weight of the moisture barrier, wherein the fat is a liquid at 40 °F (4 °C) and is from a source other than the confectionary coating.

5 52. The method of claim 45, wherein the glassy matrix is prepared by the method comprising

(a) forming a melt comprising sucrose, a polysaccharide having an average degree of polymerization of about 2 to about 4, or a mixture thereof;

10 (b) placing the melt in a mold, wherein the thickness of the melt in the mold is about 1 to about 3 mm on a flat surface;

(c) cooling the melt to form a viscous syrup and then a glassy matrix.

53. The method of claim 52, wherein the mold conforms to the shape of a container for the frozen dessert.

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54. The method of claim 52, further comprising the step of embedding crystalline sucrose when the melt has cooled to a viscous syrup.

20 55. The method of step 52, further comprising the step of covering at least one surface of the glassy matrix with a coating having a thickness of about 0.05 mm to about 0.5 mm.

56. The method of claim 45, wherein the glassy matrix is prepared by the method comprising:

25 (a) forming a melt comprising sucrose, a polysaccharide having an average degree of polymerization of about 2 to about 4, or a combination thereof;

(b) spreading the melt to a thickness of about 1 to about 3 mm on a flat surface;

(c) cooling the melt to form a viscous syrup;

30 (d) cutting the viscous syrup to the desired size and shape; and

(e) cooling the viscous syrup to form a glassy matrix topping.

57. The method of claim 56, wherein the viscous syrup is cut to conform to the shape of a container for the frozen dessert product.

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58. The method of claim 56, further comprising the step of embedding crystalline sucrose into the viscous syrup.

59. The method of claim 56, wherein the method further comprises the step of covering at least one surface of the glassy matrix with a coating having a thickness of about 0.05 mm to about 0.5 mm.

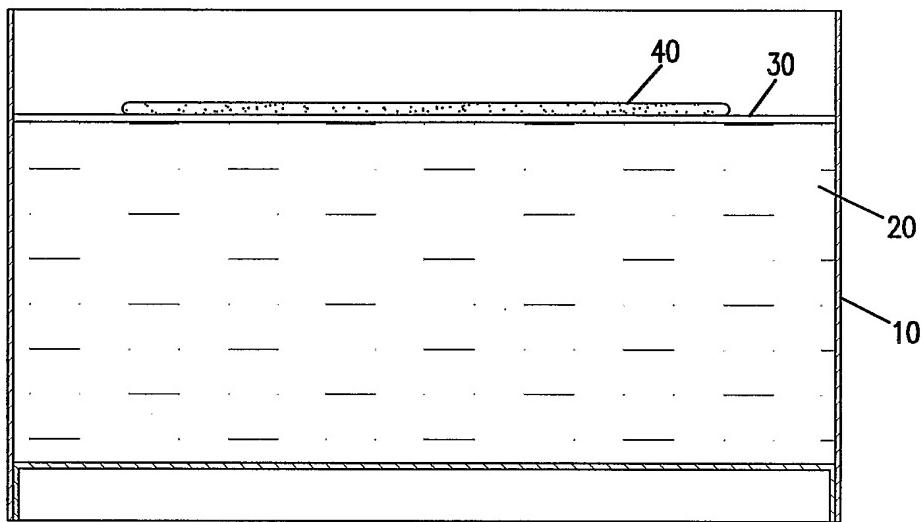
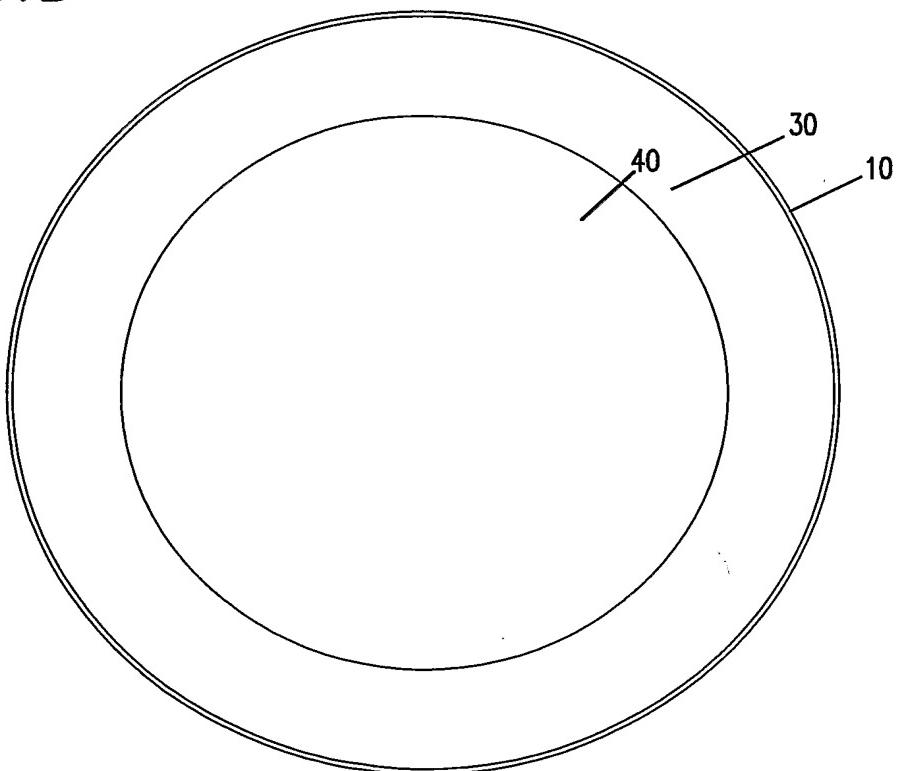
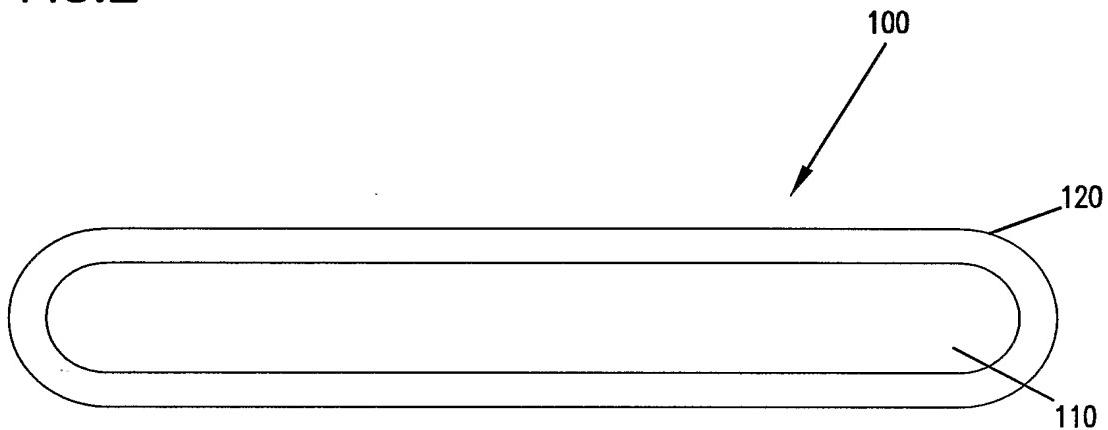
FIG.1A**FIG.1B**

FIG.2

Box No. VIII (v) DECLARATION: NON-PREJUDICIAL DISCLOSURES OR EXCEPTIONS TO LACK OF NOVELTY
The declaration must conform to the standardized wording provided for in Section 215; see Notes to Boxes Nos. VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (v). If this Box is not used, this sheet should not be included in the request.

Declaration as to non-prejudicial disclosures or exceptions to lack of novelty (Rules 4.17(v) and 51bis.1(a)(v)):

Name: Kamel Chida

Residence: Arras, France
(city and either US state, if applicable, or country)

Mailing Address: 1 Grande Rue Du Rivage
Arras, France 62000

Citizenship: USA

Inventor's Signature: *Kamel Chida* Date: *2/11/02*
(if not contained in the request, or if declaration is corrected or added under Rule 26ter after the filing of the international application. The signature must be that of the inventor, not that of the agent) (of signature which is not contained in the request, or of the declaration that is corrected or added under Rule 26ter after the filing of the international application)

This declaration is continued on the following sheet, "Continuation of Box No. VIII (v)".

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/04442

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7	A23G9/02	A23G9/28	A23G9/24
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7	A23G
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 820 533 A (SEABORNE JONATHAN ET AL) 11 April 1989 (1989-04-11)	1,2
Y	the whole document ---	3-10, 12-16, 25-27
Y	EP 0 787 435 A (MONTE WOODROW C) 6 August 1997 (1997-08-06) column 3, line 1 -column 4, line 46; examples ---	3-8
Y	US 5 798 131 A (BERTRAND FRANCIS-VICTOR ET AL) 25 August 1998 (1998-08-25) column 3, line 57 -column 4, line 48; claim 1; figure 3 ---	9,10, 12-16, 25-27
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

11 December 2002

Date of mailing of the international search report

12.03.2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

GUYON, R

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 02/04442

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 600 566 A (MOFFETT JR FRANK WESLEY) 17 June 1952 (1952-06-17) column 3, line 12 - line 23; figure 1 ---	1,2
X	EP 0 686 354 A (GERVAIS DANONE CO) 13 December 1995 (1995-12-13)	1,2
Y	the whole document ---	45-48
Y	US 4 188 768 A (GETMAN HARLAN R) 19 February 1980 (1980-02-19) column 5, line 36 - line 66; figures ---	45-48
X	US 4 353 927 A (LOVERCHECK SUSAN L) 12 October 1982 (1982-10-12) column 2, line 22 -column 3, line 21; examples ---	1-16,18
A	US 5 135 767 A (DAOUSE ALAIN) 4 August 1992 (1992-08-04) the whole document ---	1-27
A	CH 690 606 A (SOREMARTEC SA) 15 November 2000 (2000-11-15) the whole document ---	1-27
Y	US 5 518 744 A (KAESEER BEAT ET AL) 21 May 1996 (1996-05-21) page 4 ---	1-4
Y	US 6 203 831 B1 (EDER HANS-CHRISTIAN ET AL) 20 March 2001 (2001-03-20) the whole document ---	1-4
A	EP 0 882 408 A (HAYASHIBARA BIOCHEM LAB) 9 December 1998 (1998-12-09) ---	
A	US 2001/043970 A1 (CONTI CLAUDIA ET AL) 22 November 2001 (2001-11-22) -----	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 02/04442

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-27, 45-59

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-27, 45-59

Frozen dessert with moisture barrier on the surface and a glassy matrix topping over said barrier, and process for making it

2. Claims: 28-35

A moisture barrier comprising at least 70% of fat which is liquid at least at 60 w.% when stored at 40 F

3. Claims: 36-44

A glassy matrix topping having a thickness of about 1-3mm. and comprising embedded crystalline sucrose

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/04442

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 4820533	A	11-04-1989	US	4710228 A		01-12-1987
			US	4810534 A		07-03-1989
EP 0787435	A	06-08-1997	US	5789008 A		04-08-1998
			EP	0787435 A2		06-08-1997
			US	6039988 A		21-03-2000
US 5798131	A	25-08-1998	EP	0628254 A1		14-12-1994
			AU	669437 B2		06-06-1996
			AU	6333494 A		15-12-1994
			BR	9402364 A		14-03-1995
			CA	2125328 A1		12-12-1994
			CN	1099568 A		08-03-1995
			DE	69321104 D1		22-10-1998
			DE	69321104 T2		25-02-1999
			DK	628254 T3		14-06-1999
			EG	20079 A		27-03-1997
			ES	2121897 T3		16-12-1998
			FI	942692 A		12-12-1994
			JP	7135909 A		30-05-1995
			NO	942141 A		12-12-1994
			NZ	260624 A		24-02-1997
			PL	303772 A1		09-01-1995
			RU	2113798 C1		27-06-1998
			US	5647905 A		15-07-1997
			US	6242022 B1		05-06-2001
			ZA	9403755 A		09-02-1995
US 2600566	A	17-06-1952		NONE		
EP 0686354	A	13-12-1995	FR	2720902 A1		15-12-1995
			AT	183890 T		15-09-1999
			DE	69511768 D1		07-10-1999
			DE	69511768 T2		20-04-2000
			DK	686354 T3		27-03-2000
			EP	0686354 A1		13-12-1995
			ES	2138164 T3		01-01-2000
			WO	9533386 A1		14-12-1995
			FR	2720903 A1		15-12-1995
			GR	3031680 T3		29-02-2000
US 4188768	A	19-02-1980	CA	1101735 A1		26-05-1981
US 4353927	A	12-10-1982		NONE		
US 5135767	A	04-08-1992	EP	0434857 A1		03-07-1991
			AU	643958 B2		02-12-1993
			AU	6795490 A		04-07-1991
			BR	9006589 A		01-10-1991
			DE	68911928 D1		10-02-1994
			DE	68911928 T2		21-04-1994
			EG	19031 A		30-07-1994
			JP	3290154 A		19-12-1991
			MX	172757 B		11-01-1994
			NZ	236522 A		26-08-1993
			PT	96387 A ,B		15-10-1991
CH 690606	A	15-11-2000	CH	690606 A5		15-11-2000

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 02/04442

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 5518744	A	21-05-1996	WO DE EP	9324024 A1 9207601 U1 0596084 A1		09-12-1993 01-10-1992 11-05-1994
US 6203831	B1	20-03-2001	EP AT AU AU BR CA CN DE DE DK ES GR JP PT TR US ZA	0770332 A1 201303 T 715353 B2 7020396 A 9605142 A 2187940 A1 1154801 A ,B 29522295 U1 59509291 D1 770332 T3 2158041 T3 3036331 T3 9107885 A 770332 T 970389 A2 2001018083 A1 9608697 A		02-05-1997 15-06-2001 20-01-2000 24-04-1997 07-07-1998 17-04-1997 23-07-1997 12-07-2001 28-06-2001 13-08-2001 01-09-2001 30-11-2001 28-04-1997 30-11-2001 21-05-1997 30-08-2001 15-04-1998
EP 0882408	A	09-12-1998	JP DE DE EP US	11046717 A 69802618 D1 69802618 T2 0882408 A1 2002006466 A1		23-02-1999 10-01-2002 05-09-2002 09-12-1998 17-01-2002
US 2001043970	A1	22-11-2001	GB AT AU AU BR CA DE DE DK EP HU JP NO NZ PL SI SK CN CZ WO ES PT TR ZA	2341306 A 217149 T 755558 B2 5036799 A 9913504 A 2340637 A1 69901454 D1 69901454 T2 1111998 T3 1111998 A1 0104823 A2 2002524061 T 20011119 A 509981 A 346415 A1 20505 A 3002001 A3 1315833 T 20010857 A3 0013512 A1 2174625 T3 1111998 T 200100657 T2 200101918 A		15-03-2000 15-05-2002 12-12-2002 27-03-2000 05-06-2001 16-03-2000 13-06-2002 12-12-2002 02-09-2002 04-07-2001 29-04-2002 06-08-2002 04-05-2001 27-09-2002 11-02-2002 31-10-2001 06-08-2001 03-10-2001 15-08-2001 16-03-2000 01-11-2002 30-09-2002 21-06-2001 07-03-2002